



**CENTRE FOR EVIDENCE-BASED CONSERVATION**

**SYSTEMATIC REVIEW No. 15**

**DOES SHEEP-GRAZING DEGRADE UNIMPROVED NEUTRAL  
GRASSLANDS MANAGED AS PASTURE IN LOWLAND  
BRITAIN?**

**REVIEW REPORT**

**Reviewers:** Gavin B. Stewart and Andrew S. Pullin

**Postal Address:** Centre for Evidence-Based Conservation  
School of Biosciences  
University of Birmingham  
Edgbaston  
Birmingham  
B15 2TT  
U.K.

**E-mail Address:** G.B.Stewart@bham.ac.uk

**Telephone:** +44 (0)121 414 4090

**Fax:** +44 (0)121 414 5925

Stewart, G.B. and Pullin, A.S. (2006). Does sheep-grazing degrade unimproved neutral grasslands managed as pasture in lowland Britain? Systematic Review No. 15. Collaboration for Environmental Evidence.

## COVER SHEET

Title	<b>Does sheep-grazing degrade unimproved neutral grasslands managed as pasture in lowland Britain?</b>
Systematic review	<b>N°15</b>
Reviewer(s)	Gavin B. Stewart and Andrew S. Pullin
Date protocol first published on website	April 2005
Date draft review first published on website	26 May 2006
Contact addresses	Centre for Evidence-Based Conservation School of Biosciences University of Birmingham Edgbaston Birmingham B15 2TT U.K.  G.B.Stewart@bham.ac.uk
Sources of support	Funding provided by NERC.
Conflict of interests	None reported.

## SYSTEMATIC REVIEW SUMMARY

### Background

Grazing is a common management intervention for maintaining conservation value of lowland grassland throughout Great Britain. Cessation of livestock grazing on lowland grassland has reduced the conservation value of many sites but over-grazing can also be damaging. There is also concern that grazing by sheep reduces the conservation value of pastures more than grazing by cattle. As heavy sheep grazing is becoming more prevalent, empirical evidence regarding its impact is urgently required to inform decision-making.

### Objective

To assess the impact of sheep grazing on *Cynosurus cristatus*-*Centaurea nigra* (MG5) 'old meadow' pasture compared to cattle grazing, horse grazing or no management.

### Search strategy

Electronic searching of ISI Web of Knowledge, Science Direct, Directory of Open Access Journals (DOAJ), Copac, Scirus, Scopus, Index to Theses Online (1970-present), Digital Dissertations Online, Agricola, Europa, English Nature's "Wildlink", JSTOR, BIOSIS via EDINA, SIGLE via ARC2WebSPIRS. Publication searches of Agricultural Development and Advisory Service, Countryside Council for Wales, Department of Agriculture and Rural Development, Department of Environment, Food and Rural Affairs, English Nature, Joint Nature Conservation Committee, National Trust, Royal Society for the Protection of Birds, Scottish Natural Heritage. World Wide Web searches of the meta-search engines Dogpile, Alltheweb and Google Scholar. Hand-searches of bibliographies of accepted articles. Personal contact with leading researchers.

### Selection criteria

Any studies comparing the impact of sheep grazing with cattle, horses or no management on MG5 pasture in Great Britain or Ireland. Information from other grassland vegetation with floristic affinities in NW Europe was also considered for inclusion.

### Main results

Forty two studies fulfilled the inclusion criteria. Approximately, half the studies (22) were reviews, of which 12 considered only single species. Experimental and management methodologies were too diverse for meta-analysis. The results of these studies are summarised in the text.

Grazing impacts on plants are species specific and vary with stock type, and intensity of grazing. The available data do not provide clear unequivocal evidence regarding the impact of sheep grazing on pasture, but suggest that intermediate levels of grazing are most appropriate for conservation objectives with regard to plant species.

Experimental work often fails to report management activities adequately. Even where specific stock details are available, comparisons and starting points are too varied for meaningful synthesis. Generic grazing experiments agree that land use history has an important influence on species composition but are too context specific and diverse in management and outcome for general conclusions to be made.

Only one article (Roberts 1928) provides a direct comparison of sheep and cattle-grazed MG5 pasture. Plant species richness, forb biomass and diversity were lower in sheep grazed pasture. A comparison of sheep and cattle grazing on artificially restored MG5 reports a similar pattern of reduced plant diversity and forb cover under sheep grazing (Warren et al. 2002). Further work on MG5 compares the impact of horses and cattle (Gibson 1996, 1997) cautioning that species of grazer has a minor impact compared to intensity of grazing. Horses do damage MG5 sites but only at high grazing intensities, and cattle also damage sites at high grazing intensity. There are subtle variations in like-for-like impact, and these are valuable in themselves. Degradation at high grazing intensities is manifest as a reduction in floristic species richness and loss of important indicator species.

There is even less information available on grazing impacts on taxa other than vascular plants. Reviews suggest that intermediate grazing levels maximise biodiversity benefit across taxa (birds, insects and soil biotic diversity). However experimental work indicates that this may not always be the case.

Analyses of raw data from welsh MG5 grassland demonstrate that stock type and vegetation height significantly impact on plant community composition, species richness and forb abundance. However, mean forb abundance for horse, cattle and sheep-grazed sites are 11.7, 10.7 and 10.5 respectively. Thus the differences between stock types are not ecologically significant. Maximising forb abundance and species richness is achieved by maintaining sward heights at 0-10 cm for cattle and horses, although maximum forb abundance is found at sward heights >10cm for sheep, perhaps suggesting that MG5 grassland cannot support sheep grazing at the same intensity as cattle and horses if forb abundance is to be maintained.

## **Conclusions**

### *Implications for conservation*

Available evidence suggests that conservation managers considering grazing on MG5 sites should primarily be concerned with grazing intensity. Grazing at low intensities increases sward height and forb diversity but overall plant species richness is limited as bryophyte abundance declines.

Choice of stock type appears to be less critical than grazing intensity but there is some evidence that sheep grazing can result in lower forb diversity than cattle grazing at high stocking rates. There is no empirical evidence regarding the impact of different breeds on MG5 grassland, but we assume the impact of breed is negligible given that differences between species of stock are not large.

Further evidence regarding grazing intensity-stock type interactions is noticeably lacking, precluding prediction regarding stock type impacts at given stocking

intensities. Lack of detailed knowledge of land-use history is a major impediment and there is little information regarding taxa other than vascular plants.

Managers must balance changes in bryophyte abundance, forb diversity and plant species richness to achieve tradeoffs appropriate to their conservation objectives. As different taxa have different (and often unknown) management requirements, the poor evidence-base necessitates flexible site-based adaptive management and rigorous monitoring where grazing of important MG5 pastures is undertaken.

*Implications for further research*

Robust empirical evidence for the effectiveness of low intensity grazing to achieve conservation objectives on MG5 pasture is lacking. High quality comparative work comparing cattle and horse grazing is available together with lower quality information regarding sheep. A comparative dataset of 1600 grassland samples is also available. This work suggests that heavy grazing reduces plant and forb diversity and that grazing by sheep reduces diversity more than grazing by cattle. However, considerable uncertainty surrounds these results that are derived from comparisons and one short-term factorial experiment on restored MG5. More robust long-term experimentation and monitoring are required to develop the necessary evidence-base. Many important questions remain unanswered. In particular, more information is required regarding stock type-grazing intensity interactions and very little is known about grazing impacts beyond local variation in plant species richness.